Prevalence of Iodine Deficiency Disorders Among School Children of the National Capital Territory of Delhi

1996

International Council for Control of Iodine Deficiency Disorders (ICCIDD); Regional Office for South Asia & Pacific

Centre for Community Medicine
All India Institute of Medical Sciences
New Delhi - 110029, India

Prevalence of Iodine Deficiency Disorders Among School Children of the National Capital Territory of Delhi

1996

International Council for Control of Iodine Deficiency Disorders (ICCIDD); Regional Office for South Asia & Pacific

Centre for Community Medicine
All India Institute of Medical Sciences
New Delhi - 110029, India

IDD Delhi Report No. 1.

The International Council for the Control of Iodine Deficiency Disorders (ICCIDD) is a non-profit non governmental organization dedicated to the sustainable elimination of Iodine Deficiency Disorders (IDD) throughout the world. The ICCIDD was granted an official status as an International NGO at the 47th World Health Assembly held in Geneva in 1994. It's activities are supported by donations/grants from the Australian Agency for International Development (AusAID), the Canadian International Development Agency (CIDA), the Micronutrient Initiative (MI), the Netherlands Ministry for Development Cooperation, the Swedish International Development Agency (SIDA), the United Nations Children's Fund (UNICEF), the United States Agency for International Development (USAID), the World Bank, the World Health Organization (WHO), and others.

Prevalence of Iodine Deficiency Disorders Among School Children of the National Capital Territory of Delhi

Chandrakant S. Pandav[1]

Arun Malik[2]

K. Anand[3]

Smita Pandav[4]

M.G. Karmarkar[5]

1. Additional Professor, Centre for Community Medicine (CCM), All India Institute of Medical Sciences (AIIMS), New Delhi and Regional Co-ordinator, International Council for Control of Iodine Deficiency Disorders (ICCIDD), South Asia & Pacific Region

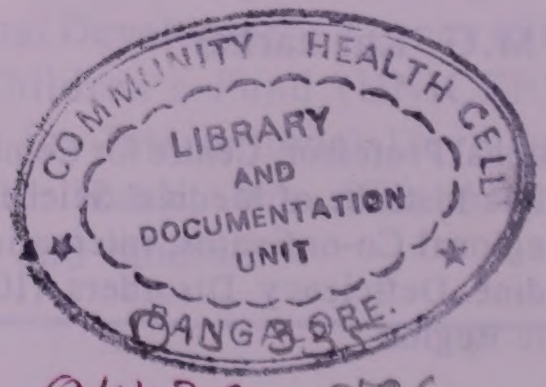
2. Junior Resident, CCM, AIIMS,

3. Assistant Professor, CCM, AIIMS,

4. Senior Research Officer, ICCIDD,

5. Senior Advisor, ICCIDD

ISBN 81-86813-00-4 (Set)
ISBN 81-86813-01-2 (Volume I)



TO THE GLOBAL PARTNERSHIP
DEDICATED TO THE ELIMINATION OF
IODINE DEFICIENCY DISORDERS

An Ancient Scourge of Mankind

The People of the affected countries
The Governments of the affected countries
The Salt Producers of each country
The International Agencies-especially
The World Health Organization
The United Nations Children's Fund
The World Bank
The Micronutrient Initiative
Kiwanis International
Program Against Micronutrient Malnutrition

The International Expert Network of
International Council for Control of
Iodine Deficiency Disorders
(ICCIDD)

The Bilateral Agencies especially
The Australian Agency for International Development
The Canadian International Development Agency
The Netherlands Ministry for Development Cooperation
The Swedish International Development Agency
The United States Agency for International Development

अखिल भारतीय आयुर्विज्ञान संस्थान
अंसारी नगर, नई दिल्ली-110029

All India Institute of Medical Sciences
ANSARI NAGAR, NEW DELHI-110029

Fax No.: 91-11-6862663
Telex No.: 031-73042 AIMS IN
तार: मेडिन्स Telegram: MEDINST
दूरभाष दफ्तर: Off.: 667571, 6864851/355
घर Resi.: 6864851/348

डा० ललित मोहन नाथ
एम.डी, एम एस, डा० पी.एच, एफ आई ए पी एस एम
सकायाध्यक्ष

Dr. LALIT M. NATH
MD, MS, Dr.PH, FIAPSM
DEAN.

संख्या / No _____

दिनांक / Date _____

Foreword

22 nd March, 1996

It was a pleasure reading this report on "Prevalence of Iodine Deficiency Disorders among schools children of National Capital Territory of Delhi". Iodine Deficiency Disorders (IDD) are a major cause of preventable mental retardation and other avoidable morbidity and mortality in the country.

In the seventies, Dr. Pandav and his team studied and highlighted the existence of IDD in Delhi. This led to the ban on the sale of uniodised salt in Delhi.

This report generated widespread interest in studying the IDD prevalence in regions other than those lying within the traditional "Himalayan goitre Belt." It also contributed to the Indian Council of Medical Research (ICMR) forming an "ICMR Task Force" to study the prevalence of IDD in the "other extra Himalayan foci" which have been subsequently reported in ICMR publication, "Epidemiological Survey of Endemic Goitre and Endemic Cretinism".

Considering the fact that iodine deficiency affects the educability of children, it is only appropriate that schools are also involved in this fight against IDD.

The Centre for Community Medicine is committed to exploring all governmental and non governmental systems for public health action. Involving the teachers and school students in a national public health programme is one such activity.

Lalit Nath

Dr. Lalit M. Nath
MD, MS, Dr. PH, FIAPSM
Director,
All India Institute of Medical Sciences,
New Delhi - 110 029, India

Acknowledgements

This project could not have been carried out without the co-operation of the school children studied the support of the school principals and teachers. We are grateful to them.

We are also thankful to the Secretary, Department of Education, Ministry of Human Resource Development, National Capital Territory of Delhi for granting permission to conduct this survey in Delhi schools.

We are grateful to Prof. Lalit M. Nath, Director, All India Institute of Medical Sciences (A.I.I.M.S.), and Professor & Head, Centre for Community Medicine (CCM); all the Faculty & Staff Members of CCM for the keen interest and the support extended for carrying out this project.

We gratefully acknowledge the support provided by the International Council for the Control of Iodine Deficiency Disorders (ICCIDD) for carrying out this project. We are also thankful to Dr. Basil S. Hetzel, Chairman, ICCIDD and Dr. Francois Delange, Executive Director, ICCIDD for their inputs from time to time.

Dr. Chandrakant S. Pandav was trained as an International Clinical Epidemiology Network (INCLEN) Fellow (Health Economics; Level - II) at

the Department of Clinical Epidemiology and Biostatistics and Centre for Health Economics and Policy Analysis (CHEPA) at McMaster University, Hamilton, Ontario, Canada. We would like to place on record our acknowledgement to the INCLEN Programme.

We are also thankful to Ms Veena, Mr. Ashok Negi for the office support and Mr. Pritam Singh Tanwar for the computer assistance.

We are also indebted to Dr. Rajesh Pandav and Ms Vandna Khare for their invaluable comments and suggestions in making this report.

Contents

Executive Summary

Background Information

Iodine Deficiency Disorders (IDD) are an important cause of mental handicap and poor educability of children. Globally 1,570 million people are living in IDD endemic areas. In India 270 million are at risk and 79 million are affected by IDD. Provision of iodine by iodine fortified salt is a proven and effective way of preventing IDD. India along with many other countries has agreed to the goal of "Universal Salt Iodization (USI) by the year 1995". This will help achieve the goal of "Elimination of IDD by the year 2000" which has been endorsed at all major international fora including World Health Assembly, World Summit for Children and International Congress of Nutrition.

Though Delhi does not lie in the classical "Himalayan goitre belt", it was shown in 1980 that IDD is endemic in Delhi. This study, conducted among school children of Delhi reported a Total Goitre Rate (TGR) of 55%. A subsequent study conducted in 1988, confirmed the IDD endemic status of Delhi. Following these reports, the sale of uniodised salt was banned from 1st June 1989. The aim of present study was to determine the IDD prevalence in Delhi five years later.

Study Objectives

To determine the status of Iodine Deficiency Disorders among school children in the National Capital Territory of Delhi using the following indicators:
Clinical : Goitre prevalence
Biochemical : Urinary iodine excretion pattern (μg/l)

Methodology

The study was a cross-sectional study one, carried out among class VI students studying in Government middle schools of Delhi in September-October 1994. A complete list of Government middle schools in Delhi was obtained. 30 schools were selected on the basis of "probability proportion to size". A sample size of 1,200 school children, was decided on the basis of an expected goitre prevalence of 50%, with 95% confidence interval and precision of $\pm$ 5% and design effect of 3. In the 30 selected schools, about 40 children in class VI of each school were clinically examined, by a trained doctor, for thyroid enlargement. On the spot casual urine samples were collected in wide mouthed screw capped plastic bottles. The urinary iodine estimation was done by wet ashing method and results were expressed as μg per litre.

Results

A total of 1,684 school children were examined. The Total Goitre Rate (TGR) among the school children was 20.5%. The TGR was 22.2% in female students

and 18.9% in male students. The median urinary iodine level was 198 μg/l. About 76.4% of the children had urinary iodine more than the recommended 100 μg/ litre urine.

Conclusions

As per the classification recommended by WHO/ UNICEF/ICCIDD, Delhi falls into the mildly endemic area by clinical criteria and "no endemicity" by the biochemical criteria. Thus, the study showed that IDD continues to be prevalent in "mild endemic" proportion.

When compared to the results from the previous surveys, it is observed, that the IDD status using both clinical and biochemical indicators have declined in the last few years. However, IDD continues to be an important public health problem in the National Capital Territory of Delhi.

Recommendations

1. IDD control measures in the form of effective salt iodization should be strengthened in Delhi.

2. The iodine content of salt should be monitored regularly. In addition to the government channels, non governmental organizations and school systems could also be involved.

3. Regular (three to five yearly) IDD prevalence surveys, which include both clinical and biochemical indicators, should be carried out to track the progress made towards the elimination of IDD.

1

Introduction

Iodine is one of the essential elements required for the normal mental and physical well being of man. The human body requires around 150 micrograms of iodine every day, which works out to less than a teaspoonful (5gm) over a life span of 70 years.

Deficiency of iodine occurs when the daily intake, specially of food and water, does not fulfil the iodine requirement of the body. This leads to an abnormal swelling in the neck called "goitre" and other spectrum of disorders now collectively referred to as Iodine Deficiency Disorders (IDD) (1). The full spectrum of IDD is shown in Table -1.1. Lack of iodine can cause irreparable harm even before birth. Mothers who are deficient in iodine may have frequent abortions and give birth to stillborn babies. The children born to such mothers are at a greater risk of dying during the first year of life. Those who survive can be permanently crippled with varying degrees of mental handicap and physical deformity commonly referred to as endemic cretinism.

Iodine deficient children suffer from tardy concentration, impaired co-ordination and sluggishness, which results in poor school performance. In addition, their energy and productivity are also

Table 1.1 *The spectrum of Iodine Deficiency Disorders.*

Stage in Life	Health Effects
Fetus	Abortions Stillbirths Congenital Anomalies Increased Perinatal Mortality Increased Infant Mortality Neurological Cretinism: - mental deficiency - deaf-mutism - spastic diplegia - squint Myxedematous cretinism: - mental deficiency - dwarfism Psychomotor defects
Neonate	Neonatal goitre Neonatal hypothyroidism
Child and Adolescent	Goitre Juvenile hypothyroidism Impaired mental function Retarded physical development
Adult	Goitre with no complications Hypothyroidism Impaired mental function

adversely affected. It has been estimated that, on an average, school children living in iodine deficient areas have an IQ level, about 13 points lower than that of children living in iodine sufficient areas (2). Thus, the total accumulated loss to the country is formidable.

Farm animals are also equally at risk to the spectrum of IDD at all stages of growth and development, from conception to adult physical performance. Reproductive failure is the outstanding manifestation of iodine deficiency in farm animals. Fetal development may be arrested at any stage, leading to either death and resorption, abortion and stillbirth, or the birth of young ones that are weak, often associated with prolonged gestation and retention of fetal membranes. More kids are born to iodine sufficient goats and the probability of survival in kids born to iodine sufficient goats is twice that of those born to iodine deficient goats (3). In addition to the reproductive disturbances described, infertility, in both male and female farm animals in iodine deficient areas, has been associated with goitre and shown to respond to iodine therapy.

2

Magnitude of Iodine Deficiency Disorders (IDD)

2.1 World

Iodine deficiency is the world's single most significant cause of preventable brain damage and mental retardation. A total of 118 countries in the world are reported to have IDD problem. It is estimated that 1,570 million people are at risk of iodine deficiency in the world today, constituting 29% of the world's population. Globally, the prevalence of goitre is estimated to be 12%. The number of subjects affected by goitre is now estimated to be 655 million, and 300 million suffer from lowered mental ability. Because of iodine deficiency in their mothers, at least 30,000 babies are stillborn every year and over 120,000 are born cretin, physically stunted, deaf-mute or paralysed (4). Thus, IDD is a significant public health problem in the world.

2.2. India

India is the second most populous country in the world with a population of 834 million (1991 census). High prevalence of goitre and cretinism exists in a broad Himalayan and sub-Himalayan goitre belt, from

Jammu & Kashmir in the west, to Arunachal Pradesh in the east, and along this entire length extending at least 500 kms south of the Himalayas into the flat sub-Himalayan terai (plains).

In addition to the well known "Himalayan endemic belt", iodine deficiency has been reported from many other states in the country. In 1989, the Indian Council of Medical Research (ICMR) carried out a multicentric IDD prevalence study. Nine states outside the traditional "Himalayan goitre belt" were studied for the prevalence of goitre and cretinism. A total of 409,923 individuals were examined and the overall goitre prevalence observed was 21.1 %,and the overall cretinism prevalence was 0.7 % (5).

In India, it is estimated that 270 million people are at risk, 79 million have goitre (6), 2.2 million are cretins and 6.6 million have mild neurological disorders. Out of the 457 districts in the country, 239 districts have been surveyed by the Government of India/State Governments. Of these, 197 districts are endemic for goitre (7).

The incidence of neonatal hypothyroidism (NH) in a severely endemic area of India (like Uttar Pradesh), is 2,400 per 100,000 births. This is 50 to 200 times more than the reported average incidence of NH in advanced countries, which have controlled iodine deficiency by effective and sustained iodine fortification programmes (8). This means that on an average, with every passing hour, 10 children are born, in the

country, who will not attain their optimal mental and physical potential as a result of neonatal hypothyroidism due to environmental iodine deficiency.

2.3 Delhi

The Goitre Control Cell, National Goitre Control Programme, Ministry of Health and Family Welfare, Government of India carried out a goitre prevalence survey in the capital in the years 1975 - 1978. They have reported a goitre prevalence of 29%.Subsequently, two other school based studies have been done to assess the prevalence of IDD in Delhi.

2.3.1 Study No. - 1.

C.S. Pandav et al (Indian Journal of Medical Research 1980;72:81-88.) (Reference No. 9)

Study year - 1978-79

Study area - Kalkaji & Chandni Chowk

Study population - School children
- one boys and one girls school were studied in each area.

Sample size - 3,200

Outcome variable - i) Clinical examination for goitre
ii) Urinary iodine excretion μg/gm creatinine
iii) Radioactive Iodine Uptake

Table 2.1 *Comparison of IDD assessment indicators in different studies done among school children of Delhi in last two decades.*

Author	Study Year	Study Population	Sample Size	Prevalence of IDD		
				TGR (%)	Mean Urinary Iodine (μg/1)	Severity
Pandav et. al	1978-79	Govt. School Children	3,200	55.0	48.0	Moderate to Severe
Sharma et. al	1981	All School Children	27,890	20.3	64.8	Mild to Moderate
	1981	Govt. School Children	5,675	37.1	Not available	Severe

Note:

i) The classifcation used originally in the study has been modified to the current recommended one by ICCIDD/WHO/UNICEF (11) for better comparison.

ii) The denominator of per gram creatinine is no longer used. To convert to per litre of urine; it is recommended that this may be considered equivalent to each other. Also, earlier studies have reported mean rather than median urinary iodine levels.

Results: The results are given in Table 2.1.

The Total Goitre Rate (TGR) was 55%. Out of this 32% had grade 1 goitre and the remaining 23% had grade 2 goitre. The grading of goitre used in this study was an earlier classification which has been modified according to the current classification as recommended by WHO/UNICEF/ICCIDD for easier comparison. The study also found that 64% of children from the Kalkaji schools, and 69% from the Chandni Chowk schools, had urinary iodine excretion less than 50 μg/ gm creatinine (equivalent to per litre). The affinity for radioactive iodine, as evidenced by the high thyroidal 24 hour I^{131} uptake, was observed in 68.75% of the children studied from both these areas. This strongly suggested a prevailing state of iodine deficiency in these clinically euthyroid children.

2.3.2.Study -2

Col S.K. Sharma et al (Indian Journal of Nuclear Medicine Vol 3 Number 1 January 1988) (Reference No. 10)

Study year : 1981

Study Area : Various parts of Delhi

Study population : School children
Age group - 5 to 18 years

Sample size : 27,890 school children
(14,980 boys and 12,910 girls)

Outcome variable : i) Clinical examination for goitre;
ii) Urinary iodine excretion μg/gm creatinine.

Results : The results are presented in Table 2.1

The prevalence of goitre varied between 20.3% and 37.1%. The prevalences of goitre in children belonging to a higher socio-economic class studying in public schools, was lower than that among the children from government schools, who come predominantly from the low or middle socio-economic strata of the society. The mean urinary iodine excretion was 64.8 ± 16.58 μg/gm creatinine. A total of 50% of government school children, 49% from rural schools and 42% from public schools, excreted less than 50 μg/gm creatinine in urine.

Based on the findings of these studies, the Government of Delhi banned the sale of uniodised salt in the Union Territory of Delhi with effect from 1st June, 1989. Thus, the population of Delhi should have received iodized salt supply for the last five years. It was therefore decided to assess the current status of IDD in Delhi.

3

Objectives

To determine the status of Iodine Deficiency Disorders among school children in the National Capital Territory of Delhi using the following indicators:

Clinical : Goitre prevalence

Biochemical : Urinary iodine excretion pattern (μg/l)

4

Methodology

Study design : Cross-sectional study

Study period : September and October 1994

Study population : School children of the middle schools of Delhi, in the age group of 12 years which corresponds to the students of class VI.

Outcome variables :i) Goitre prevalence
ii) Urinary iodine excretion level (μg/l).

Sample size : 1,200 (approximately 40 children each from 30 schools)

Based on :	Estimated prevalence	: 50%*
	Confidence Interval	: 95%
	Precision	: ±5%
	Design Effect	: 3

[* This is on the basis of prevalence found in the study by Pandav et al (9) and also represents the worst scenario (no impact of intervention). This assumption also ensures the maximum sample size for any prevalence at the given precision.]

Sampling methodology: There are 165 government schools in Delhi which enrol children in middle school. (The government aided schools, and public schools have not been included). Of these, 30 schools were selected on the basis of "Probability Proportionate to size". One section in Class VI was selected randomly and all the students in the class, present on the day of the survey were examined. Class VI was included as the criteria recommended by WHO/UNICEF/ ICCIDD for severity of public health problem pertains to the age group 6-12 years (11).

Table 3.1 *Classification of goitre as recommended by WHO/ UNICEF/ ICCIDD*

Grade	Description
Grade 0 :	No palpable or visible goitre
Grade 1 :	A mass in the neck that is consistent with an enlarged thyroid that is palpable but not visible when the neck is in the normal position. It moves upward in the neck as the subjects swallows. Nodular alteration(s) can occur even when the thyroid is not enlarged
Grade 2 :	A swelling in the neck that is visible when the neck is in a normal position and is consistent with an enlarged thyroid when the neck is palpated

Consent : An informed written consent was taken from the principals of the schools selected.

Clinical : All the students present on the day of survey were clinically examined for goitre. A doctor, trained and validated in grading of goitre, carried out the clinical examination. The grading of goitre was done as per the classification recommended by the Joint WHO/ UNICEF/ICCIDD Consultation held in Geneva, 1993 (11) and is given in Table - 3.1

Biochemical: Casual urine samples were collected in wide mouth screw capped plastic bottles from a minimum of 40 students in a school. Urinary iodine estimation was done using wet ashing method by Gutekunst et al and results were expressed as μg/l (12).

Figure 5.1 Map of Delhi showing the location of schools (●) selected.

5

Results

The list of the schools in which the study was done is given in Annexure-10.1 and their location mapped on Figure 5.1. A total of 1,684 school children studying in class VI were covered. Though the sample size estimated was 1,200, a total of 1,684 students were examined. This was because all the children present on the day of survey, rather than a sample of 40 students, in the class were examined. Most of the students are expected to be 12 years old, as per the requirement of age at the time of school admission. However, a majority (53.8%) were above 12 years of age. This indicates mainly delayed school admission or failures.

The age and sex distribution of the children is given in Table 5.1. There was a slight preponderance of female students (51%) in the study sample.

Table 5.1 *Age and sex distribution of the sample school children.*

Age yrs	Sex		Total (%)
	Male (%)	Female (%)	
10 - 12	380 (48.8)	399 (51.2)	779 (46.2)
12 - 14	445 (49.2)	460 (50.8)	905 (53.8)
Total	825 (49.0)	859 (51.0)	1684 (100)

The result of the clinical examination for goitre is shown in Table - 5.2 and Figure - 5.2. The Total Goitre Rate (TGR) was 20.5% and if the results are limited to children in the age group of 10-12 years it is 19.7%. As is evident from Figure 5.2, grade 1 goitre accounted for 17.3%, while grade 2 (visible) goitre accounted for 3.2%.

Table 5.2 *Age wise prevalence of goitre in Delhi school children*

Age yrs	Goitre grade (%)			TGR (%)
	0	1	2	
10-12	626 (80.4)	129 (16.6)	24 (3.1)	19.7
12-14	712 (78.7)	163 (18.0)	30 (3.3)	21.3
Total	1338 (79.5)	292 (17.3)	54 (3.2)	20.5

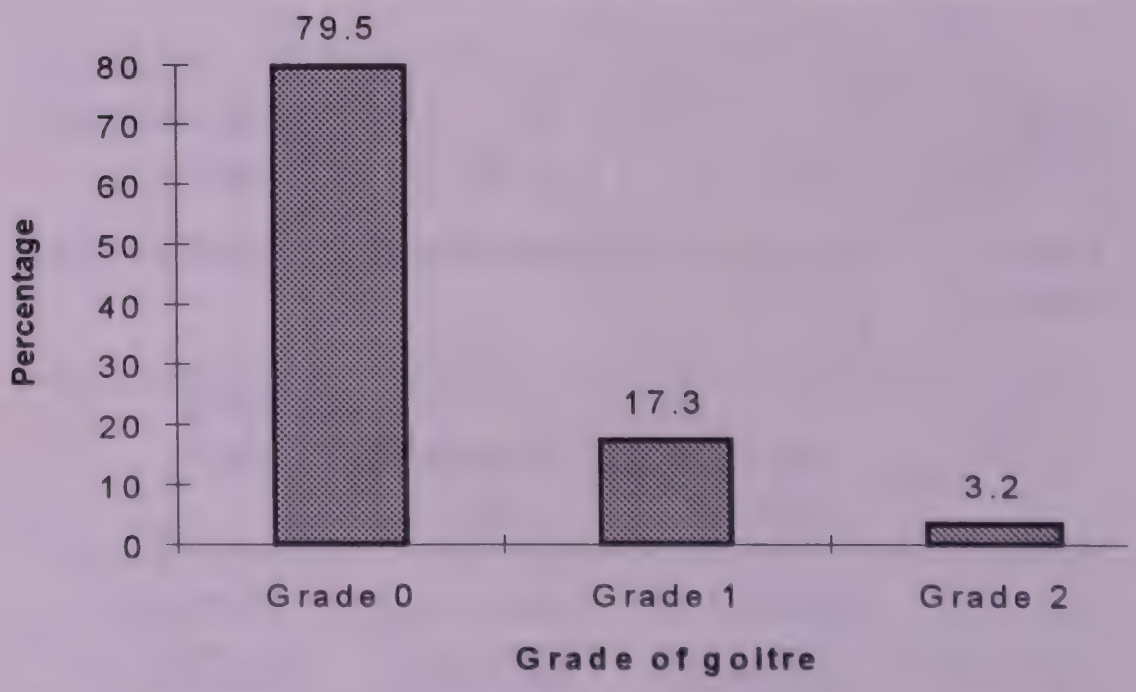


Figure 5.2 Prevalence of goitre in school children of Delhi, 1994 (n=1,684)

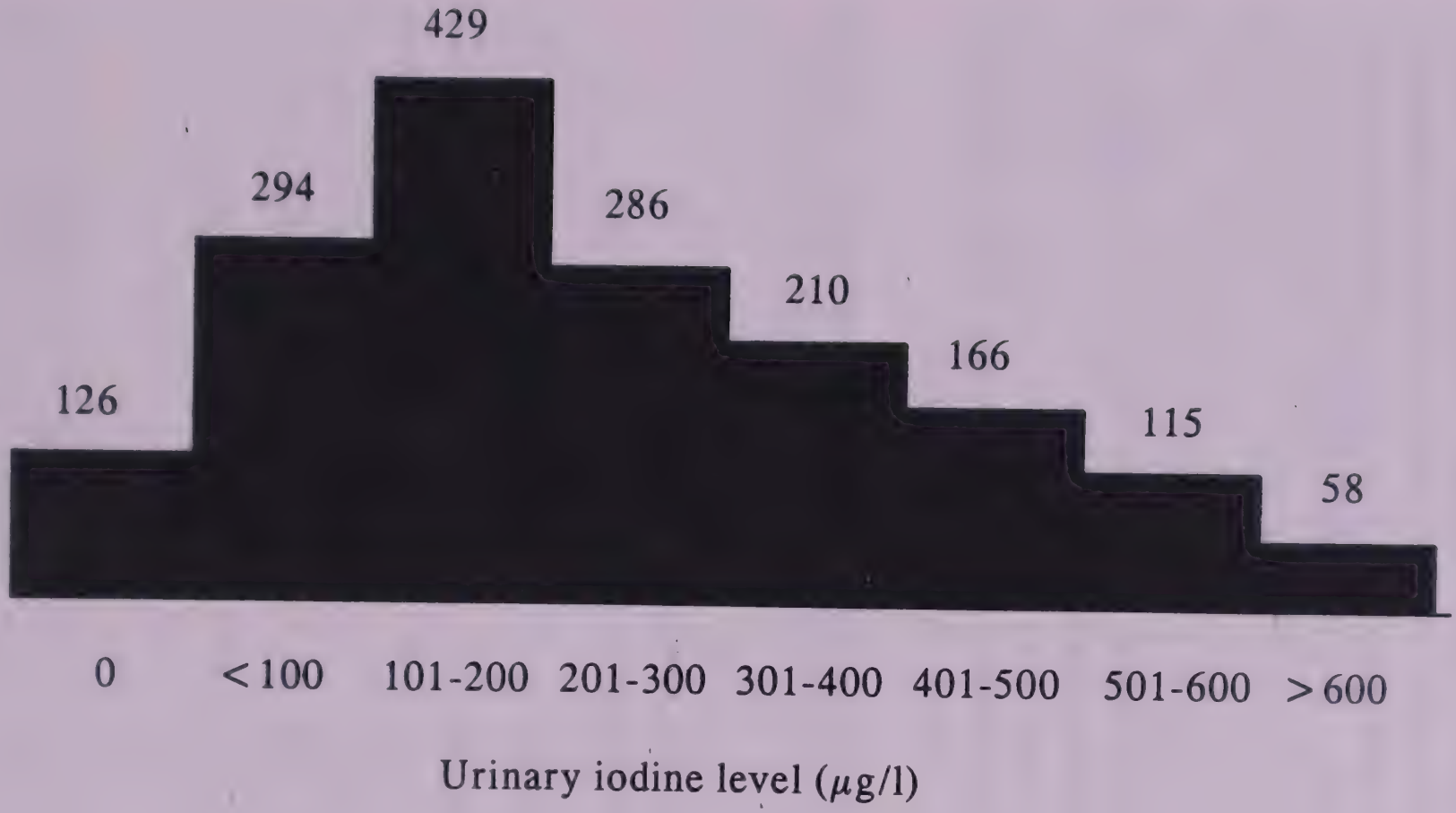


Figure 5.3 Distribution of urinary iodine levels in school children of Delhi.

Casual urine samples were collected from all the children and urinary iodine level was estimated. Table 5.3 and Figure 5.3 give the distribution of the urinary iodine levels. The median urinary iodine level was 198 μg/l urine. A total of 23.6% of the children had urinary iodine less than the recommended 100 μg/l urine, of which 7.5% had no iodine in the urine. It is possible that these children could have substituted water in place of urine.

Table 5.3 *Urinary iodine excretion (UIE) pattern of school children in Delhi.*

UIE Levels (μg/l)	Total	Percentage
0	126	7.5
< 100	294	17.4
101-200	429	25.5
201-300	286	17.0
301-400	210	12.5
401-500	166	9.9
501-600	115	6.8
> 600	58	3.4
Total	1,684	100.0

6

Discussion

As recommended by WHO/UNICEF/ICCIDD, a summary of cut-off points and prevalences that are considered indicative of significant public health problem for IDD are given in Table 6.1

Table 6.1 *Summary of IDD prevalence indicators and criteria for a public health problem*

		Severity of public health problem (prevalence)		
Indicator	Target population	Mild	Moderate	Severe
Goitre Grade > 0	SAC	5.0-19.9%	20.0-29.9%	≥ 30%
Median urinary iodine level (µg/l)	SAC	50-90	20-49	< 20
TSH > 5 mU/1 whole blood	neonates	3.0-19.9%	20.0-39.9%	≥ 40%

Source: From the report of a Joint WHO/UNICEF/ICCIDD Consultation on 'Indicators for Assessing Iodine Deficiency Disorders and their Control through Salt Iodization' Geneva, November 1992. Document WHO/NUT/94.6.

The results of the present study summarised in Table 6.2 show that IDD continues to be endemic in a mild degree in Delhi.

Table 6.2 *Severity of IDD as a public health problem in Delhi.*

Indicator	Value	Severity
Total Goitre Rate (%)	19.7	Mild
Median urinary iodine level (μg/l)	198	No Iodine deficiency

When we look at the cross-sectional surveys carried out at different periods of time in Delhi (Table 6.3), the trend suggests that IDD prevalence is declining.However it is important to recognize the methodological limitation of these studies.

The comparison of urinary iodine levels in studies done among school children of Delhi is given in Table 6.4.

When the first two studies were done, the urinary iodine estimations were expressed as μg of iodine per gram of creatinine, a practice which has been discontinued now. It is recommended that in general (except in a population where protein intake is very low), the same results can be expressed as μg of iodine per litre of urine.

Table 6.3 *Comparison of prevalence of goitre in studies done among government school children of Delhi.*

Author & Ref. No.	Study year	Sample size	TGR (%)	Severity
Pandav et.al. (9)	1978-79	3,200	55.0	severe
Sharma et.al. (10)	1981	5,675	37.1	severe
Pandav et.al. (Present study)	1994	1,684	19.7	mild

Table 6.4 *Comparison of urinary iodine levels in studies done among government school children of Delhi.*

Author & Ref. No.	Study year	Sample size for iodine estimation	Urinary iodine level (μg/l)	Severity
Pandav et.al. (9)	1978-79	525	48 (mean)	Moderate
Sharma et.al. (10)	1981	466	65 (mean)	Mild
Pandav et.al. (Present study)	1994	1,684	198 (median)	No deficiency

The previous studies have reported mean rather than median urinary iodine levels. As the urinary iodine levels are not normally distributed, the mean and median are not likely to be similar. Therefore, the interpretation based on mean is subject to bias. Depending on the skewness of distribution, the median may be more or may be less than the mean. As the two earlier studies have not reported the distribution, it is difficult to estimate the median. However, in the study by Pandav et.al (9), it is reported that 62.5% of the urine samples had iodine levels less than 50 μg/l and in the study by Sharma et al (10), they reported that 65% children had urinary iodine level less than 75 μg/l. Therefore, the interpretation about the severity of this public health problem appears valid. The results based on goitre prevalence and urinary iodine excretion, seems to suggest that the trend is towards the reduction of IDD prevalence in Delhi.

7

Conclusion

On the basis of both the clinical and biochemical indicators, it is reasonable to assume that there is a trend towards a decline in the prevalence of IDD in the last few years. However, IDD continues to be an important public health problem. Based on the earlier field studies, it is known that three to five years of uninterrupted iodised salt supply with adequate iodine reduces the goitre prevalence to 50% of the baseline prevalence. Howeveŕ, another study carried out in 1994 - 1995 in Delhi, showed that only 76.7% of the 16,596 salt samples brought from households of the government school children studied over a period of 9 months had iodine when tested by spot testing kits. Therefore, it is essential that monitoring of iodine content of salt is done on a regular basis.

8

Recommendations

1. IDD control measures in the form of effective salt iodization should be strengthened in Delhi.

2. Monitoring of iodine content of salt should be done regularly. In addition to the government channels, non governmental organizations and school systems should also be involved.

3. Regular (three to five yearly) IDD prevalence surveys (which include both clinical and biochemical indicators), should be carried out to track the progress made towards the elimination of IDD.

9

References

1) Hetzel, B.S. 1983. 'Iodine deficiency disorders and their eradication'. Lancet 2: 1126-9.

2) Bleichrodt, N., M.Ph. Born, 1994. 'A meta-analysis of research on iodine and its relationship to cognitive development'. In J. Stanbury eds. The damaged brain of iodine deficiency: neuromotor, cognitive, behavioral, and educative aspects. Report of the Franklin Institute Symposium, Publ. Cognizant Communication Corporation.

3) Groppe, B., N. Anke, B. Kohla, Scholze. 1986. 'The influence of different iodine supply in reproduction and to the intrathyroidal iodine content of goats and sheep'.

4) World Health Organization, 1993. WHO/ UNICEF/ICCIDD 'Global prevalence of Iodine Deficiency Disorders, Micronutrient Deficiency Information System'. MDIS Working Paper # 1.

5) ICMR Task Force Study : Epidemiological survey of endemic goitre and endemic cretinism. Indian Council of Medical Research, New Delhi, 1989.

6) Pandav, C. S., M.G. Karmarkar, L.M. Nath, National Goitre Control Programme; National

Health Programme service-5, National Institute of Health and Family Welfare, New Delhi. 1988.

7) Ministry of Industry. Banning sale of edible non-iodised salt: An urgent measure. Produced by The Salt Department, Ministry of Industry with support from UNICEF, 1995.

8) Kochupillai, N., M.M. Godbole, C.S. Pandav, M.G. Karmakar, M.M.S. Ahuja. Neonatal thyroid status in iodine deficient environments of the sub-Himalayan region. Indian Journal of Medical Research, 1984 ; 80 : 293-8

9) Pandav, C.S., N. Kochupillai, M.G. Karmakar, K. Ramachandran, Gopinath, L.M. Nath. Endemic goitre in Delhi Indian Journal of Medical Research :1980, 72: 81-80

10) Sharma, S.K., D.N. Dham, K.L. Khurana, S.K. Jain, R.P. Walia, N.S. Maharda, R.K. Shukla. Goitre prevalence in Delhi —A baseline survey for monitoring iodated salt prophylaxis. Indian Journal of Nuclear Medicine 1988; 2 (I): 18-21.

11) WHO/UNICEF/ICCIDD Indicators for assessing Iodine Deficiency Disorders and their control through salt iodization. WHO/NUT/94.6., 1993-4.

12) Karmakar, M.G., C.S. Pandav, K.A.V.R. Krishnamachari. 1986 : Principal and procedure for iodine estimation : A laboratory manual. Indian Council of Medical Research, New Delhi.

10

Annexure

10.1. List of Schools Selected for IDD Prevalence Survey

District North

1. Govt. Boys Sr. Sec. School, No. 1, Keshav Puram
2. Govt. Boys Sr. Sec. School, No. 1, Shakarpur
3. Govt. Boys Sr. Sec. School, Partap Nagar
4. Govt. Boys Sr. Sec. School, No. 2, Shakarpur
5. Govt. Boys Sr. Sec. School, J.J.Cly., Wazirpur
6. Govt. Boys Middle School, Shakarpur

District Central

7. Govt. Boys Middle School, Mubarakpur Dabas
8. Govt. Boys Middle School, (Urdu medium), Tagore Road
9. Govt. Girls Middle School, Ram Nagar - I
10. Govt. Girls Middle School, Ramjas Lane - I
11. Govt. Boys Middle School, Ramjas Lane - I

District East

12. Govt. Girls Middle School, East of Loni Road, DDA Flats.
13. Govt. Boys Middle School, Mustafabad
14. Govt. Girls Middle School, Mustafabad
15. Govt. Co-ed. Middle School, Khajuri Khas
16. Govt. Girls Middle School, Vijay Park, Mauj Pur
17. Govt. Co-ed Middle School, Jafrabad
18. Govt. Boys Middle School, Teliwara
19. Govt. Boys Middle School, Jhilmil Colony

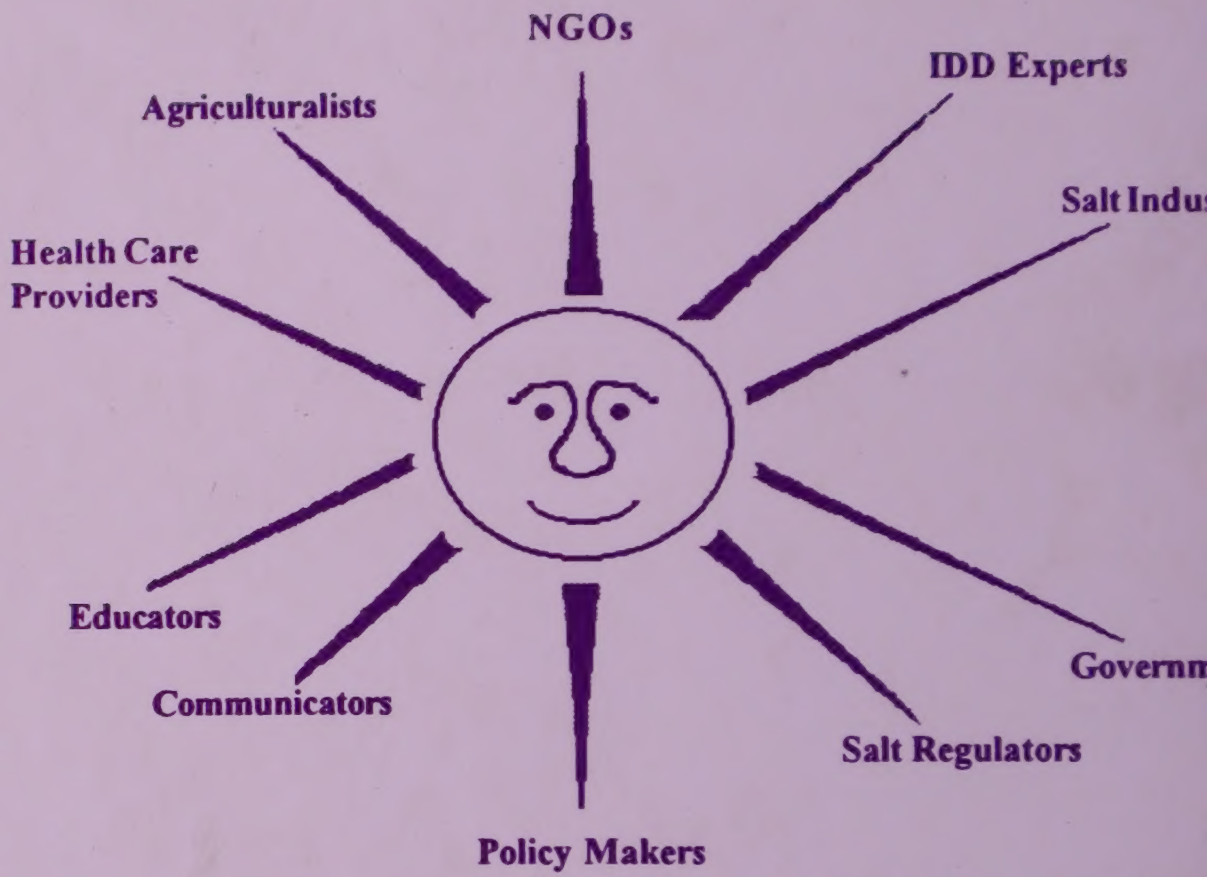
20. Govt. Girls Middle School, Circular Road
21. Govt. Co-ed. Comp. Middle School, Vishwas Nagar
22. Govt. Co-ed. Middle School, School D Block, Shakarpur
23. Govt. Girls Middle School, Shivpuri
24. Govt. Boys Middle School, E Block, Krishan Nagar

District South

25. Govt. Boys Middle School, Pushp Vihar

District West

26. Govt. (Rural) Girls Middle School, Pandwala Khurd
27. Govt. (Rural) Boys Middle School, Baproda (Co-edn.)
28. Govt. (Urban) Boys Middle School, Ambika Vihar (Co-edn.)
29. Govt. (Urban) Boys Middle School, Ashok Nagar, Block 59
30. Govt. (Urban) Girls Middle School, Tilak Nagar, Block 24



Sustaining Elimination of IDD

ICCIDD

International Council
for Control of
Iodine Deficiency Disorders

ISBN 81-86813-00-4 (Set)
ISBN 81-86813-01-2 (Volume I)

Printed at Sona Printers Pvt. Ltd. B-181 Okhla Ph-1, N.D.-20.